REMARKS/ARGUMENTS

Reconsideration of this application is requested. Claims 1-3, 8-14 and 19 are pending subsequent to entry of this Amendment.

The claims have been amended to more particularly point out and distinctly claim applicants' invention and to advance prosecution.

The scope of claim 1 has now been amended and significantly restricted to a method of depositing cadmium mercury telluride as specified in original claim 4 (i.e. $Hg_{1-x}Cd_xTe$, where $0 \leq x < 1$), using an isopropylallyl telluride precursor, wherein the $Hg_{1-x}Cd_xTe$ is grown by an interdiffused multilayer process involving the alternate growth of cadmium telluride and mercury telluride layers, which are then interdiffused to produce $Hg_{1-x}Cd_xTe$. The interdiffused multilayer process (IMP) is described in detail on page 8 of the original PCT application.

Claims 4 to 7 have been consequentially deleted.

One advantage of the method now specified in claim 1 is that both the MT and CT layers may be laid down in the presence of mercury vapor (see page 8). As a result, the alternate layers may conveniently be laid down merely by interrupting the supply of the organocadmium compound. New dependent claim 19 is now directed to that aspect.

Claims 15 to 18 have also been deleted.

A minor clarifying amendment has been made to claim 13.

Applicants' Contributions to the Art

The invention specified in amended claim 1 is a method of depositing **cadmium mercury telluride** (CMT) onto a substrate involving the **interdiffusion of alternately deposited layers** of cadmium telluride (CT) and mercury telluride (MT), the respective telluride layers being formed by the reaction of isopropylallyl telluride either with an organocadmium compound or mercury vapor. By varying the respective thicknesses of the alternately deposited layers, the value of x may be conveniently varied. The use of the isopropylallyl telluride reagent in the Interdiffused Multilayer (IMP) process, together with the use of mercury vapor to form the MT layer, gives a special combination of advantages over other reagents known from the prior art, including low process temperatures, ease of operation, safe handling, good growth rates and no by-products.

One particular problem associated with the growth of telluride layers using some organotellurium precursors is the formation of highly undesirable by-products (c.f. page 2 line 31 to page 3 line 3 of the description). The present inventors have investigated the use of methylallyl telluride as a telluride precursor, and, despite the suggestion in Valentine *et al* (EP 0285834) that methylallyl telluride would be a suitable reagent for telluride growth, they have found that the reaction of methylallyl telluride with mercury vapor leads to highly undesirable by-products and does not, in fact, yield CMT (c.f. Applicant's discussion on page 3 line 29 to page 4 line 4). Problems have also been encountered with diisopropylallyl telluride and diallyl telluride, for example higher growth temperatures and difficult storage and handling (c.f. paragraph spanning pages 3 and 4).

The present inventors have found, however, that, when using isopropylallyl telluride as a precursor with elemental mercury, the formation of undesirable by-products is alleviated (c.f. page 5 lines 10-12), while still being able to maintain low growth temperatures (300°C in Example 1). Furthermore, the present IMP process provides a convenient and controllable method for forming CMT, while CT growth can conveniently proceed in the presence of mercury vapor, and may even be assisted by its presence (c.f. page 5 lines 5 to 6 , page 8 line 15). This gives a particular advantage, in that a mercury over-pressure can be maintained in the reactor during the CT growth cycle of an IMP process, thereby preventing highly undesirable loss of mercury from the sample surface during CMT growth.

Thus, the present invention is an improved MOVPE method of depositing CMT on a substrate, which method uses an IMP process together with a specially selected combination of reagents not previously known, or suggested by, the cited prior art.

Claim rejections under 35 USC § 102

Valentine *et al* (EP 0285834) has been cited by the Examiner in respect of the novelty of independent claims 1 and 17, and dependent claims 2 to 10. The rejection of claim 17 has been overcome by cancelling it from the application. However, it is submitted that claim 1 as now amended is clearly patentable over Valentine *et al* because Valentine *et al* does not disclose every feature of the invention now claimed.

Valentine *et al* does not disclose the use of an Interdiffused Multilayer (IMP) process, and certainly does not disclose or suggest the use of such a process to form CMT. The value of x

in $Hg_{1-x}Cd_xTe$ produced by IMP may conveniently be determined by the relative thickness of the CT and MT layers. The only specific CMT growth process disclosed in Valentine *et al* (Example 6) appears to proceed by feeding all of the reagents into the reactor together, to give an unusual direct alloy growth process; this is not an IMP process at all. Thus, the use of an IMP method to form CMT according to claim 1 is clearly neither anticipated nor suggested by Valentine *et al.*

Valentine *et al* teaches that CMT, CT and MT can be produced by a MOVPE technique using various allyl tellurides as the tellurium source, and gives isopropylallyl telluride as one possible example of such. However, the use of isopropylallyl telluride is not specifically disclosed in the Examples, which instead use methylallyl telluride as the preferred reagent. Certainly, there is no disclosure of the use of isopropylallyl telluride and mercury vapor **in combination** as reagents, or any indication of the advantages of using them in the IMP process.

As explained above, Applicants have found that a significant number of the tellurides disclosed in Valentine *et al* are not, in practice, suitable as precursors. In particular, most alkyl tellurium compounds containing methyl groups are undesirable as MOVPE precursors because the reactivity of the Me radical leads to undesired by-products, particularly in the presence of elemental mercury.

Although Valentine *et al* discloses the generic use of mercury vapor as a reagent, the only CMT growth process specifically described (in Example 6) teaches away therefrom in that it employs an organo mercury compound (specifically dimethyl mercury). Such a compound is much more toxic than elemental mercury and is unlikely to produce good results in view of its high stability. Accordingly, although its use in combination with the selected methyl allyltelluride was probably necessary in Valentine *et al* (to avoid by-products), the resulting process would not be commercially viable.

In summary, Valentine *et al* does not disclose or suggest the use of an IMP process to form CMT, especially the use of an IMP process involving isopropylallyl telluride, and nor does it suggest the particular benefits of using isopropylallyl telluride as a reagent in an IMP process involving elemental mercury. Thus, amended claim 1 is clearly patentable over Valentine *et al*, and claims 2, 3, 8-10 and 19 are patentable by virtue of their dependency on new claim 1

Claims 5-7 and 17 have been cancelled from the application, so no objections to those claims now arise under 35 USC § 102. However, the Applicant wishes to point out to the

Examiner in passing that claim 7, directed to a method of depositing cadmium telluride in the presence of mercury vapor, is not, in fact, anticipated by Valentine *et al.* (The section of text highlighted by the Examiner refers to MT, not CT, deposition.)

Claim rejections under 35 USC § 103

Claims 11-16 have been rejected as obvious over Valentine *et al* in combination with Ahlgren (US 5,189,297), and claim 18 has been rejected as obvious over Valentine *et al* in combination with Morrison *et al.*

It is submitted that claims 11-14 are patentable by reference to amended claim 1. Independent claims 15, 16 and 18 have been cancelled from the application, so no objection to those claims now arise.

Reconsideration and allowance are solicited.

Respectfully submitted,

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